

REMARKS

The applicants thank the Examiner for the thorough examination of the application. The applicants believe that no new matter is added to the application by this Amendment.

Status Of The Claims

Claims 1-3, 5 and 12-17 are pending and stand ready for further action on the merits. Claims 8-11 are cancelled by this Amendment. The amendments to claims 1 and 12 clarify their language. Claims 13-17 respectively correspond to claims 2, 3, 5, 9 and 10.

Statement Of Substance Of Interview

The Examiner is thanked for graciously conducting an interview with the applicants' representative on June 29, 2004. During the Interview, the rubber composition of the inventive tire was discussed in light of the conventional art of Koch (US 3,038,515). Advantages of the invention arising from the exclusion of silica were noted.

At the end of the Interview the Examiner prepared an Interview Summary. The Interview Summary has been reviewed, and it appears to accurately describe the substance of the Interview.

Rejection Under 35 U.S.C. §112, First Paragraph

Claim 1-3, 5 and 8-12 are rejected under 35 U.S.C. §112, first paragraph as failing to respond to the written description requirement. Applicants traverse.

In the Office Action, the Examiner asserts that the term “at least one diene rubber . . .” in claims 1 and 12 was not adequately described in the specification. Claims 1 and 12 have been amended to replace this term with the term “a diene rubber . . .” This limitation finds clear support at page 4, line 11 of the specification.

This rejection is overcome and withdrawal thereof is respectfully requested.

Rejection Under 35 U.S.C. §112, Second Paragraph

Claim 1-3, 5 and 8-12 are rejected under 35 U.S.C. §112, second paragraph as being indefinite. Applicants traverse.

In the Office Action, the Examiner asserts that the term “consisting of” in claims 1 and 12 eliminates the recitation of any additional components not recited in that claim. Claims 1 and 12 have been clarified by stating: “the only rubber component of said first rubber composition consisting of 60 to 95% by weight of a halogenated butyl rubber and 5 to 40% by weight of a regular butyl rubber . . .” Any issues pertaining to claims 8-11 have been obviated by the cancellation of these claims.

As a result, the claims are clear, definite and have full antecedent basis. This rejection is overcome and withdrawal thereof is respectfully requested.

Rejections Under 35 U.S.C. 103(a) Based On Koch

Claims 1-3, 5 and 8-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Koch (US 3,038,515) in view of the Exxon technical article ("Bromobutyl Rubber, Compounding and Applications", 1986), Gessler (US 4,014,852) and optionally Hous (GB 2072576). Claims 1, 3, 5 and 8-12 are rejected under 35 U.S.C. 103 as being unpatentable over Koch in view of Berta '686 (US 4,616,686) and Berta '302 (US 4,587,302). Applicants respectfully traverse each of the aforesaid rejections.

The Present Invention And Its Advantages

The present invention pertains to a heavy duty pneumatic tire having an inner liner and a rubber layer located between a carcass and the inner liner. The inventive tire is capable of satisfactorily excluding air and moisture, and the tire is also free from crack generation problems due to high internal air pressure and to heat generated while the tire is running.

One of the many novel aspects of the invention arises from the exclusion of the use of silica in the intermediate layer (second rubber composition).

The present invention finds a typical embodiment in claim 1:

1. (Currently Amended) A pneumatic tire having a carcass of at least one layer, said carcass having a pair of ends engaged with a pair of bead cores on both sides with each of the ends being turned up outwardly from an inner side around each of the pair of bead cores, an inner liner prepared from a first rubber composition disposed radially inside of the carcass, and a rubber layer disposed between said carcass and said inner liner;

the only rubber component of said first rubber composition consisting of 60 to 95% by weight of a halogenated butyl rubber and 5

to 40% by weight of a regular butyl rubber, said regular butyl rubber being an isobutylene-isoprene copolymer rubber, and

said rubber layer being prepared from a second rubber composition consisting of a diene rubber selected from the group consisting of a natural rubber, an isoprene rubber, a styrene-butadiene rubber and a butadiene rubber, a carbon black, sulfur and a sulfenamide vulcanization accelerator;

the amount of sulfur of said second rubber composition being represented by the equation (I):

$$2 + 0.05A < x < 5 + 0.05A \quad (I)$$

wherein X is the amount of sulfur in parts per hundred of the diene rubber of said rubber layer and A is the percentage by weight of the regular butyl rubber in the rubber component of said first rubber composition.

Distinctions Of The Invention Over Koch And The Secondary References

Koch pertains to a laminated article that utilizes silica to improve adhesion. Typically, Koch at column 1, lines 26-30 states: "The present invention overcomes the difficulties of the prior art in adhering GRS to butyl-type rubber by the addition of silica oxide to one of the rubbery components of the laminate and the chlorination of the butyl-type rubber portion of the laminate before the article is vulcanized." Also, Koch at column 1, lines 36-40 states: "It is also an object of the invention to improve the adhesion of layers of GRS to layers of butyl-type rubber by incorporating silica in one of the layers and chlorinating the butyl-type rubber."

Koch fails to disclose or suggest a technology that does not rely upon silica. The present invention, by its transitional language, excludes the use of silica, which Koch uses to improve the vulcanization adhesion by adding silica to the SBR (GRS) layer and chlorinating the adjacent butyl rubber layer.

At page 4, lines 1-7 of the Office Action, the Examiner refutes this difference between the invention and Koch, stating:

[I]t is noted that Koch et al. seems to contemplate that the silica need only be added to "one of the rubbery components of the laminate" (col. 1, lines 26-30) or by "incorporating silicon in one of the layers" (col. 1, lines 36-40). As such, it is considered that this reference would have been read by the artisan as including teachings of a tire in which the silica need not be added to the GRS layer (i.e. added only to the butyl layer) and as such, bonding of a butyl liner to the carcass using a GRS layer without silica is disclosed or certainly obvious from these teachings.

However, the passages in column 1 of Koch et al. (quoted above) describe how he achieves his invention by adding silica. Koch fails to teach how to attain enhanced properties without the use of silica, such as in the unexpected results presented in the Declaration executed on July 22, 2002.

In contrast, the disclosure of Koch at column 2, line 46 to column 3, line 75 clearly teaches that the incorporation of silica in the intermediate SBR layer and the chlorination of the butyl-type rubber improves the adhesion. Koch does not teach that the improvement in adhesion is achieved by incorporating silica in the chlorinated butyl rubber instead of the intermediate SBR layer.

Further, Koch at column 4, lines 4-11 states that "the silica may be added to the butyl rubber portion of the combination as well as to the GRS portion." By this, Koch indicates that not only is it essential to add silica to the butyl rubber portion, but the incorporation of silica into the intermediate SBR layer is essential to the technology of Koch. The principal of operation of Koch must therefore be changed in order for the Examiner to use this reference.

If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious. *In re Ratti*, 270 F.2d 810, 123 USPQ 349 (CCPA 1959) (Claims were directed to an oil seal comprising a bore engaging portion with outwardly biased resilient spring fingers inserted in a resilient sealing member. The primary reference relied upon in a rejection based on a combination of references disclosed an oil seal wherein the bore engaging portion was reinforced by a cylindrical sheet metal casing. Patentee taught the device required rigidity for operation, whereas the claimed invention required resiliency. The court reversed the rejection holding the "suggested combination of references would require a substantial reconstruction and redesign of the elements shown in [the primary reference] as well as a change in the basic principle under which the [primary reference] construction was designed to operate." 270 F.2d at 813, 123 USPQ at 352.).

In this case, Koch clearly depends on the inclusion of silica to promote adhesion. If no silica is used, as in the invention, then the fundamental principal of operation of Koch is change. Koch thus cannot be used as the basis of a *prima facie* case of obviousness over the invention. Therefore, even if Koch is combined with any of the posited combinations of the secondary references, these combinations would fail to suggest the invention.

Further, even if Koch suggests incorporating silica into only the inner liner, the rubber component of the inner liner of Koch is composed of chlorinated butyl rubber and natural rubber (diene rubber). Koch teaches at column 4, lines 12-29

that in order to improve poor vulcanized adhesion between the carcass and a butyl-type rubber liner, an intermediate layer composed of SBR loaded with silica is inserted between the carcass and the liner. Koch thus requires the use of an intermediate layer composed of SBR and the use of an inner liner composed of a blend of chlorinated butyl rubber and natural rubber in order to achieve improved adhesion.

In contrast, the claimed inner liner of the invention (first rubber composition) does not contain any diene rubber such as the natural rubber required by Koch.

Koch is therefore directed at improving the adhesion between the intermediate layer and the inner liner layer. Koch teaches that natural rubber is used with chlorinated butyl rubber in order to provide building tack (see footnote 1 at column 3, line 24 of Koch - Example II). Koch fails to provide any teaching or suggestion that would lead one having ordinary skill in the art to replace both natural rubber, which serves to enhance the adhesion, and chlorinated butyl rubber in the inner liner composition of Koch's Example II by a blend of bromobutyl rubber as taught in the secondary references.

The Examiner turns to Exxon for teachings pertaining to rubber blending. Exxon at page 53, lines 1-5 states:

Blends of elastomers are formulated to obtain a balance of desired properties for specific applications. Bromobutyl will impart lower gas permeability and improved heat, flex and weather resistance to non-butyl elastomers. Natural rubber in a blend with Bromobutyl improves building tack, elasticity and additional co-cure compatibility toward highly unsaturated rubber substances.

These teachings of Exxon pertaining to natural rubber agrees with those of Koch. Exxon provides no teaching or suggestion that would motivate one having ordinary skill in the art to replace the chlorobutyl rubber in the inner liner of Koch (together with natural rubber) by a blend of regular butyl rubber and bromo- or chlorobutyl rubber.

Thus, even if the inner liner of Koch is modified in view of Exxon, the modified inner liner contains natural rubber and is fundamentally different from the claimed inner liner (first rubber composition).

That is, the claimed invention has good vulcanized adhesion between the inner liner and the intermediate diene rubber layer that is achieved by using, in the intermediate layer, a sulfenamide vulcanization accelerator with a specific amount of sulfur correlated with the content of regular butyl rubber in the rubber component of the inner layer. Neither Koch nor Exxon teach or suggest such inventive features of the curing system for the diene rubber layer (intermediate layer). Although Exxon may discuss accelerator systems at page 8, these systems pertain to butyl-type rubbers for use in the inner liner.

The combination of Exxon with Koch is therefore insufficient to allege *prima facie* obviousness.

House pertains to improving adhesion between a diene rubber carcass and a halobutyl rubber inner liner by interposing an intermediate layer of a blend of a diene rubber and a halobutyl rubber. In Examples 1-3 of Hous, composition V for the intermediate layer is prepared by mixing composition A for the inner liner and composition B for the carcass in a ratio of 1/1.

The intermediate layer in Hous, which contains a blend of diene rubber and halobutyl rubber, is distinct from the claimed intermediate layer, which contains no butyl-type rubbers. Hous rather teaches incorporating a diene rubber into halobutyl rubber in order to achieve good adhesion of the halobutyl rubber to the adjacent diene rubber layer, as in the inner liner of Koch, which contains a blend of chlorobutyl rubber and natural rubber and which adheres to the SBR intermediate layer. Therefore, the combined teachings of Koch when optionally combined with Hous (and Exxon and Gessler) would fail to motivate one having ordinary skill in the art to produce a claimed embodiment of the invention.

Further, even if the inner liner of Hous is modified in view of the teachings of Exxon, the thus modified pneumatic tire of Hous has an intermediate layer containing a halobutyl rubber, which is distinct from the claimed intermediate layer.

Gessler pertains to a blend of a conjugated diene-containing butyl rubber (high reactivity butyl) with regular butyl rubber or halogenated butyl rubber. The conjugated diene-containing butyl rubber is different from regular butyl rubber or halogenated butyl rubbers. Gessler fails to disclose or suggest the use of a blend of regular butyl rubber and a halogenated butyl rubber.

Gessler discusses that the use of less potent accelerators, such as sulfenamides, are particularly useful in sulfur-type vulcanization of the blend of the high-reactivity butyl with regular or halogenated butyl rubber (see Gessler at column 5, lines 49-53). At column 3, lines 11-14, Gessler reasons that “the conjugated dienes butyl rubber [high reactivity butyl] cures in about one-fifth the

time necessary to cure butyl or halobutyl rubber, even using the 'mild' cure packages." The use of less potent accelerators is thus not meant for regular butyl rubbers, halogenated butyl rubbers or blends thereof. The Board stated that "the avoidance of the more potent accelerators in the bonding layer when using blends of halobutyl/regular butyl would have been obvious to the ordinary artisan to avoid problems with improper cure of the blends." However, the teachings of Gessler about the use of less potent accelerators for the blend containing the high reactivity butyl rather teach or suggest the use of more potent accelerators for halobutyl/regular butyl blends. Further, Gessler fails to provide any teaching or suggestion about a curing system for use in the diene rubber layer adjacent to the regular butyl-halogenated butyl inner liner that does not contain the conjugated diene-containing butyl rubber (high reactivity butyl).

As a result, combining Gessler with Koch, Exxon and optionally House would fail to motivate one having ordinary skill in the art to produce a claimed embodiment of the invention. That is, Koch teaches that it is essential to incorporate silica in the intermediate layer GRS (SBR) layer, and Koch fails to teach or suggest incorporating silica in only the inner liner of butyl-rubber (see Koch at column 3, line 45 to column 4, line 11). The secondary references of Exxon, Gessler and Hous fail to address these failings of Koch. A *prima facie* case of obviousness has thus not been made over Koch, Exxon, Gessler and optionally House.

Further, even if it assumed *arguendo* that the combination of Koch with the secondary references suggests the invention, this obviousness would be rebutted

by unexpected results. That is, Koch fails to teach how to attain enhanced properties without the use of silica, such as in the data set forth in the Declaration executed on July 22, 2002. The advantages of the invention are thus clear in light of these unexpected results.

Further, the Examiner applies Berta '686 and Berta '302 to Koch to allege obviousness. The Examiner uses Berta '686 for teachings pertaining to mixtures of butyl rubber and halobutyl rubber. The Examiner uses Berta '302 for teachings pertaining to mixtures of butyl rubber and halobutyl rubber, as well as chlorinated hydrocarbon polymer. However neither Berta '686 nor Berta '302 addresses the failure of Koch to disclose or suggest a silica free technology, such as is claimed in the present invention.

As a result, one having ordinary skill in the art would not be motivated by the combination of Koch with Berta '686 and Berta '302 to produce a claimed embodiment of the invention. A *prima facie* case of obviousness has thus not been made over Koch, Berta '686 and Berta '302. Even if this combination suggests the invention, unexpected results over Koch (discussed above) offer full rebuttal.

These rejections are overcome and withdrawal thereof is respectfully requested.

Conclusion

Based upon the above amendments and comments, Applicants respectfully submit that the claims are in condition for allowance. A notice to such effect is earnestly solicited.

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Robert E. Goozner, Ph.D., Esq. (Reg. No. 42,593) at the telephone number of the undersigned below.


If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17; particularly, extension of time fees.

Respectfully submitted,

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